

## STA 5208 – Linear Models (Summer 2019)

**Instructor:** Fred W. Huffer

Office: Room 209C OSB.

E-mail: [huffer@stat.fsu.edu](mailto:huffer@stat.fsu.edu)

**Textbook:** None

**Prerequisites:** Knowledge of Math Stat/Inference (such as in STA 5327); some prior exposure to applications of ANOVA and regression (such as in STA 5166 and 5167); familiarity with matrix/vector notation and some exposure to linear algebra.

**(Tentative) Syllabus:**

- Random effect and mixed effect models.
- Overview of General Linear Models.
- Review of Basic Matrix Algebra. Subspaces and Projections. Orthogonal Decompositions. Eigenvalue-Eigenvector Decomposition (Spectral Decomposition).
- Random Vectors; Manipulation of Mean Vectors and Covariance Matrices.
- Multivariate Normal Distribution. Distribution of Linear Transformations and Quadratic Forms. Results on Independence of Quadratic Forms. The Noncentral Chi-squared Distribution.
- Applications: Orthogonal Decompositions for Two-Way ANOVA and General Linear Model.
- The Normal Equations: their derivation and solution for models of full rank. The relationship between the normal equations and projection operator approaches.
- Distribution of Least Squares Estimates. Optimality Properties (BLUE and MVUE). Confidence Intervals and Ellipsoids.
- Generalized Least Squares.
- Discussion of Less-than-full-rank Models. Generalized (Conditional) Inverses. Estimable Linear Combinations.
- Hypothesis Testing: Tests on a subvector. The General Linear Hypothesis. Discussion for both Full-rank and Less-than-full-rank Models. Testable hypotheses. Testing from the Projection Operator Viewpoint. Equivalence of “testable” hypotheses with the subspaces arising in the projection approach.
- Orthogonal Designs. Designs in which two factors are orthogonal “given” a third factor.

**Grading:** Your grade will be based on quizzes (equally weighted) and a final exam, which will be based primarily on the lecture notes. Your course total will be computed weighted  $2/3$  on the quiz average and  $1/3$  on the final exam. The grade cutoffs are 90.0% for the lowest A-, 80.0% for the lowest B-, and 70.0% for the lowest C-. However, these grade cutoffs may be adjusted *downward* at my discretion.

**University Attendance Policy:**

Excused absences include documented illness, deaths in the family and other documented crises, call to active military duty or jury duty, religious holy days, and official University activities. These absences will be accommodated in a way that does not arbitrarily penalize students who have a valid excuse. Consideration will also be given to students whose dependent children experience serious illness.

**Academic Honor Policy:**

The Florida State University Academic Honor Policy outlines the University's expectations for the integrity of students' academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process. Students are responsible for reading the Academic Honor Policy and for living up to their pledge to "...be honest and truthful and...[to] strive for personal and institutional integrity at Florida State University." (Florida State University Academic Honor Policy, found at <http://fda.fsu.edu/academic-resources/academic-integrity-and-grievances/academic-honor-policy>.)

**Americans With Disabilities Act:**

Students with disabilities needing academic accommodation should: (1) register with and provide documentation to the Student Disability Resource Center; and (2) bring a letter to the instructor indicating the need for accommodation and what type.

Please note that instructors are not allowed to provide classroom accommodation to a student until appropriate verification from the Student Disability Resource Center has been provided.

This syllabus and other class materials are available in alternative format upon request.

For more information about services available to FSU students with disabilities, contact the:

Student Disability Resource Center  
874 Traditions Way  
108 Student Services Building  
Florida State University  
Tallahassee, FL 32306-4167  
(850) 644-9566 (voice)  
(850) 644-8504 (TDD)  
sdrc@admin.fsu.edu  
<http://www.disabilitycenter.fsu.edu/>